

Remarks

Claims 1-38 were originally filed and are pending. Independent Claims 1 and 38 are being herein amended to expressly recite the definition of the term “substantially inorganic photoreactive composition” that is set forth at page 4, lines 10-12, of Applicants’ specification.

Rejection Under 35 U.S.C. Section 102

Claims 1-27 and 36-38 were rejected under Section 102(e) as being anticipated by U.S. Patent Application Publication No. 2004/ 0012872 (Fleming et al., hereinafter referred to as Fleming). This rejection is respectfully traversed for the following reasons.

Fleming describes methods for producing a region of at least partially reacted material in a photoreactive composition. In one embodiment, such a method involves the use of an exposure system that includes three or more light beams to generate a non-random three-dimensional pattern of light using optical interference from the three or more light beams. The method further includes exposing a photoreactive composition to the three-dimensional pattern to at least partially react a portion of the material in correspondence with the non-random three-dimensional pattern of light incident thereon. (See Paragraph [0022].) The Examiner has asserted that such method anticipates Applicants’ claimed process.

Applicants’ process differs from Fleming, however, in at least one significant way: Applicants utilize a substantially inorganic photoreactive composition (see, for example, Claim 1). A “substantially inorganic photoreactive composition” is defined at page 4 of Applicants’ specification as being a photoreactive composition that, upon photoreaction and pyrolysis, loses less than about 80 percent of its initial weight. Applicants have amended independent Claims 1 and 38 to expressly recite this definition.

Applicants’ specification further explains that such a composition can be prepared, for example, by including a plurality of inorganic particles in an otherwise organic composition (formed from organic reactive species) or by forming a composition comprising hybrid organic/inorganic reactive species. Hybrid organic/inorganic reactive species can be used in the photoreactive compositions with or without the addition of inorganic particles. Useful hybrid organic/inorganic reactive species include silane compounds that have at least one polymerizable

organic group. (Suitable reactive species and inorganic particles are described, for example, at pages 4-11 and 35-39 of Applicants' specification.)

In contrast, Fleming neither teaches nor suggests the use of a multi-beam interference (MBI) technique to expose a substantially inorganic photoreactive composition. Rather, Fleming describes conventional organic photoreactive compositions (see Paragraphs [0073]-[0096] and Example 8, which utilizes only organic materials and includes no removal step).

Unlike conventional MBI processes that use organic materials, the process of the invention utilizes a substantially inorganic photoreactive composition to produce thermally stable, robust, highly ordered periodic dielectric structures that can withstand temperatures up to, for example, about 600 to 1300°C. The structures often exhibit high refractive index contrast by virtue of their inorganic nature. Yet, the structures also permit contrast enhancement through semiconductor chemical vapor deposition (CVD), followed by removal of the structure by, for example, hydrogen fluoride etching to produce air voids. Thus, the process of the invention meets the need for a process that can directly or indirectly provide high refractive index contrast periodic dielectric structures. Since Fleming neither teaches nor suggests such a process, Applicants respectfully submit that their claimed process is indeed patentable over Fleming and respectfully request that the rejection under Section 102 be withdrawn.

Rejection Under 35 U.S.C. Section 103

Claims 28-35 were rejected under Section 103(a) as being unpatentable over U.S. Patent Application Publication No. 2004/ 0012872 (Fleming et al., hereinafter referred to as Fleming) in view of U.S. Patent Application Publication No. 2004/ 0198582 (Borrelli et al., hereinafter referred to as Borrelli). This rejection is respectfully traversed for the following reasons.

Borrelli describes optical elements and a method of making optical elements. The method includes the steps of providing a silver halide-containing glass material; exposing the glass material to patterned ultraviolet radiation having a peak wavelength of less than about 300 nm or to pulsed patterned radiation having a peak wavelength of between 600 nm and 1000 nm, thereby forming exposed regions and unexposed regions; and subjecting the exposed glass material to a heat treatment to form the optical element, wherein exposed regions of the glass

material have a substantially different refractive index than unexposed regions of the glass material after being subjected to the heat treatment. (See Paragraphs [0009] and [0010].)

The Examiner has stated that Fleming discloses the removal of reacted or unreacted portions of photoreactive composition following exposure, but that Fleming does not disclose the deposition of a semiconductor material in any resulting voids. The Examiner has further asserted that Borrelli corrects this deficiency of Fleming by describing the filling of gratings with silica. This is incorrect.

Applicants note that Fleming describes an optional development (or removal) step in Paragraph [0188] but that Fleming's actual MBI experiment (Example 8) did not involve such a step. In addition, both Fleming and Borrelli fail to describe deposition.

Rather than describing a deposition step, Paragraph [0040] of Borrelli (referenced by the Examiner) discloses the covering of irradiated samples with a high purity fused silica block, followed by heat treatment in a furnace at 550°C for 2 hours. This procedure is explained in Paragraph [0027] of Borrelli, which includes the following sentence: "During the heat treatment, it may be desirable to cover the surface of the glass, for example, with a block of high purity fused silica, in order to protect the surface from discoloration in the furnace."

Thus, the step referenced by the Examiner is for protection purposes and is not a deposition of any sort. Applicants therefore respectfully submit that their claimed process is indeed patentable over this combination of references and respectfully request withdrawal of the rejection under Section 103.

Concluding Remarks

Entry of the amendments contained herein is respectfully requested. Such amendments could not have been presented earlier, as Applicants believed the now expressly-stated limitations to have been inherently present through use of the defined term “substantially inorganic photoreactive composition.” Reconsideration and allowance of Applicants’ claims are therefore respectfully requested.

Respectfully submitted,

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Date

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